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THE IMPACT OF REGULATION ON THE STRUCTURE AND PERFORMANCE OF FINANCIAL MARKETS: THE CASE OF HONDURAS.

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Introduction

Politicians in developing countries frequently claim that free financial markets may not necessarily promote socially desirable activities and serve distributional goals. This claim has been the rationale for the tight regulation of formal financial activity. Although most of these regulatory efforts have yielded disappointing results, politicians have been rarely concerned with how specific policies affect the financial market's size and performance. As a result, finance continues to be heavily regulated and distorting financial policies stand in the way of economic growth and stability. Promoters of liberalization claim, on the other hand, that financial markets that operate freely may mobilize and allocate domestic resources more successfully (Shaw; McKinnon, 1973; Gonzalez-Vega, 1986); Blejer and Sagari).

This paper explores the impact of regulation on the structure and performance of financial markets in Honduras during the 1975-83 period. The main tool of analysis is the estimation of a bank profit function, in order to derive conclusions about market efficiency. The Honduran authorities have argued that the small size of the market and the high concentration of the funds mobilized in a few large banks have resulted in the poor performance of the banking system. Politicians cite as evidence of these deficiencies the concentration of banking operations in the urban areas, the high transaction costs incurred in the provision of financial services, and the substantial profits of the financial industry (Gonzalez-Vega and Camacho). In response to these actual or presumed shortcomings, the Honduran authorities have actively intervened in financial markets. Rather than improving market performance, however, regulation has introduced allocative distortions and has created opportunities for rent-seeking by powerful interest groups. This paper examines the behavior of Honduran banks and the structure of this country's financial markets, in order to explore the validity of the assumptions behind the ostensible objectives of the Honduran regulators.

The Honduran Financial System

With a population of over 4.5 million, Honduras has one of the lowest per capita incomes in Latin America (less than US$700 in 1986). This small, open economy exports primarily bananas and coffee. Output growth, therefore, is significantly influenced by fluctuations in the country's supply and in the international prices for these two commodities. Income levels and fluctuations, in turn, influence the demand for and supply of financial services. The boom in world coffee prices, a recovery in banana production after hurricane damage in 1975, and a surge in public investment resulted in an annual real rate of growth of GDP of 7 percent during 1976-79. Declining prices for coffee and other exports, higher oil import values, and the service of the growing foreign debt led to a sharp economic decline during 1980-83 (see Table 1). Fiscal deficits financed with domestic credit from the Central Bank and with external debt fueled inflation. These problems were accentuated by capital flight, estimated at U.S. $500 million, and by a reduction of foreign financing for the private sector (Gonzalez-Vega, 1984; Ruhl).

The Honduran financial system exhibits features pointed out by McKinnon (1980) for developing economies: (1) a limited issue of primary securities (bonds and stock) by individual economic units and a greater reliance on self-finance when compared to more developed economies; (2) most of the primary securities issued by non-financial firms are acquired by financial intermediaries; and (3) most of the financial assets held by the public are liabilities of the banking system. Therefore, the banks play a key role in the channelling of savings towards investment and in the financing of working capital.

By 1975, 13 private commercial banks, 6 savings and loan associations, and 3 public development banks participated in the market. Most commercial banks had been established during the 1960s. Since then the banking system experienced a sustained expansion, both in terms of the number of institutions and of the number of bank branches, that lasted through 1978. The stagnation of the Honduran economy and the failure of a major bank (BANFINAN) led to reduced entry into the market after 1978.

While the rapid increase in the number of market participants and of bank offices reflected sustained financial deepening during the 1960s and most of the 1970s, the expansion of the branch network also reflected the need for the banks to rely on non-interest forms of competition in order to capture a larger share of the market for deposits, particularly when inflation accelerated after the mid-1970s, and real interest rates became negative (Camacho and Gonzalez-Vega). The number of branches increased from 198 in 1971 to 300 in 1983. Most of this growth resulted from new branches of the private commercial banks and the savings and loan associations. Few of the new branches,

however, were full-service branches (credit-granting as well as deposit-gathering). Rather, most of these branches had authority for deposit mobilization only. More and more-conveniently located branches reduced transaction costs for potential clients and allowed the corresponding banks a competitive edge in the market for deposits. Interest-rate competition was important, as well, and represented a major determinant of substantial changes in market shares among the commercial banks.

By 1983 the three largest commercial banks held 45 percent of the total assets and 40 percent of the deposits mobilized from the public by the banking system. This reflected the substantial reduction in market concentration that had taken place during the previous two decades (Camacho and Gonzalez-Vega). In addition, important ownership, directorate, and financial links among the commercial banks and savings and loan institutions, and among financial institutions and non-bank productive enterprises have characterized the Honduran system.

Honduran Financial Policies

Financial institutions in Honduras are regulated by the Board of Directors of the Central Bank. This Board includes representatives of private financial institutions, the public development banks, social constituencies, and the government. Through time the Board has enjoyed relative but declining autonomy from the Executive branch.

Financial policies in Honduras have reflected the use and abuse of arguments for intervention. These policies have included interest-rate controls, restrictions on the range of services that different intermediaries may provide, requirements on the amounts and ways in which banking institutions maintain reserves, and entry conditions. Central Bank regulation has also included portfolio restrictions, in attempts to force private banks to allocate a proportion of their portfolio to specific activities and groups, frequently at below-market interest rates, as well as targeted rediscounting schemes and special credit programs, frequently financed by international donors. In addition, on the basis of considerations about market failure and the need to promote socially desirable activities, Honduran politicians have strongly supported the establishment of public financial agencies in order to promote, among others, agricultural, housing, and industrial activities. Finally, the direct financing of public-sector expenditures, through the inflation tax, government bonds eligible for bank reserve requirements, and the explicit or implicit crowding out of the private sector in domestic credit portfolios has reflected an outright fiscal purpose of intervention.

Taxation, inflation, confiscatory reserve requirements, interest-rate ceilings, and distorted foreign-exchange rates have not only been instruments to limit the profits of financial intermediaries, but have also reduced incentives for deposit mobilization, resulted in smaller formal financial markets, and limited the possibilities for intermediaries to exploit scale and scope economies and to adopt new financial technologies. Financial markets, however, have adjusted to this market regulation, as the intermediaries have strived to maintain their profitability. The importance of implicit prices illustrates these attempts to circumvent regulations. Implicit pricing, however, requires the use of additional resources in order to complete transactions and to counter the implicit taxes or enjoy the implicit subsidies. Nevertheless, despite these higher costs, regulatory avoidance allows the intermediaries to remain viable in the face of repressive interventions and reduces the efficiency losses that result from distorting controls. As an evasion mechanism, the proliferation of non-regulated financial intermediaries usually increases transaction costs and risks, but it also reduces the degree of distortion and restores access to financial services for excluded clientele (Gonzalez-Vega, 1986).

Financial Market Efficiency

Concerns with efficiency in financial markets have been a major argument for intervention. At least four dimensions of efficiency have been explored in the literature: the arbitrage of information, the valuation of assets and liabilities, the provision of stores of value and inflation hedges, and functional efficiency (Tobin). Functional efficiency, which is the focus of this paper, is related to the main functions of finance: the administration of the payments mechanism, the intermediation between savers and investors, and the management of risk and insurance.

This paper is concerned with both technical and price efficiency. A firm is considered technically more efficient than another when, given the same quantities of measurable inputs Xi, it consistently produces higher levels of output. On the other hand, a firm is considered to be price-efficient if it maximizes profits. In a competitive environment, given two firms with varying degrees of technical and price efficiency but facing the same level of prices, the firm with higher profits is considered to be the economically more efficient firm (Lau and Yotopoulos, 1971). Divergences between private and social costs, common in developing countries, are not considered here. Although the authorities may attempt to correct for such distortions, we assume that they do not have the power and administrative capacity to do so in Honduras. Rather, intervention in this country has mostly been the result of rent-seeking activities and of efforts to accumulate market and political power by various interest groups.

A Model of the Banking Firm

The nature of the production technology and of the production decisions of financial institutions shapes the relationships between regulation, market structure, and industry performance. There are two basic ways to model banking firms: the cost-function approach and the profit-function approach. Bank cost functions have been used more extensively, but they focus primarily on operating or technical efficiency (Cuevas, Chavez-Presa, Srinivasan). The regulators, however, are frequently more concerned with price efficiency. The proponents of the profit function argue that their approach allows for wider possibilities to explore these two dimensions of economic efficiency --price and technical efficiency (Hancock; McFadden; Mullineaux).

The profit-function approach is adopted in this paper as the framework for the analysis of the Honduran banking system. Financial institutions are conceptualized as multi-input, multi-output firms. Bank technology is characterized by the transformation function $T(X,X_k)$, where X is the vector of variable-input and output amounts and X_k is the level of fixed inputs. The distinction between outputs and inputs is not clear cut in the case of banks. Deposits, for example, may be viewed as an input into the production of loans and other investments, or as the output in the production of services valuable to the bank customers. In the present case, however, there is no need for an a priori classification of inputs and outputs, since prices are the arguments in the profit function.

Let u represent the vector of user costs of goods and services X, as perceived by the suppliers of inputs or buyers of bank outputs. Banks perceive services that generate revenues as outputs and services that generate costs as inputs. Then:

$$X_i > 0 \quad \text{if } u_i < 0 \text{ for outputs, and}$$

$$X_i < 0 \quad \text{if } u_i > 0 \text{ for inputs, for } i=1,2,3,..,n. \qquad (1)$$

Banks are assumed to maximize profits. If banks are price takers in both input and output markets and the profit function is concave, a profit-function dual to $T(X,X_k)$ is given by:

$$\pi(p, X_k) = \max \Sigma\, p_i.X_i \;, \quad \text{s.t. } T(X,X_k) = 0. \qquad (2)$$

where p is a vector of variable-input and output prices and prices are defined as:

$$p_i = |u_i| \quad \text{for } i=1,2,...,n. \qquad (3)$$

Using Hotelling's lemma, functions for the demand for variable inputs and the supply of outputs are given as:

$$X_i = d\pi(p,X_k)/\, dp_i \qquad \text{for } i=1,2,\ldots,n, \tag{4}$$

These functions can also be expressed as:

$$p_i.X_i\ /\pi = d\ln\pi\ /\ d\ln p_i \tag{5}$$

The characteristics of the banking technology may be identified indirectly, through an estimation of the profit function, in view of the formal duality between profit and production functions. The values of the parameters obtained may then be used to test hypotheses concerning economies of scale, differences in economic efficiency across institutional types, and the impact of regulation on economic efficiency (Lau, 1969; Mullineaux). The approach also allows for substitution possibilities between inputs and between outputs, which is an important characteristic of production functions in multi-input, multi-output firms. In addition, with this approach it is possible to consider firms that participate in several or all markets and to study a wide array of market configurations. Furthermore, the use of prices as variables in the profit function permits the inclusion of policy instruments in the construction of proxies, in order to study the impact of regulation on bank profitability. Dummy variables may also be introduced in order to differentiate among institutional types that are subject to different levels of intended regulation and to determine whether or not differences in efficiency may be actually explained by regulation.

Functional Form

The most flexible functional form that allowed the estimation of a profit function on the basis of available data for the Honduran banking system was the translogarithmic. The advantage of a translogarithmic function is that, by allowing interaction coefficients between the exogenous variables (X,X_k), it makes less-restrictive assumptions than the Cobb-Douglas specification about substitution possibilities across inputs and outputs. This is particularly important when modelling financial firms, since some liabilities are, at the same time, outputs and intermediate inputs in the production of other financial services. The use of a translogarithmic function assumes that the profit function takes the following form:

$$\ln(\pi) = \alpha_0 + \Sigma\ \alpha_i.\ln(p_i) + \Sigma\ \alpha_k.\ln(X_k) + \Sigma\Sigma\ \beta_{ij}.\ln(p_i).\ln(p_j)$$

$$+ \Sigma\ \Sigma\ \beta_{ik}.\ln(p_i).\ln(X_k) + \Sigma\ \Sigma\ \beta_{kk}.\ln(X_k).\ln(X_k) \tag{6}$$

In this case supply and demand functions take the following form:

$$d\ln(\pi) / d\ln(p_i) = \alpha_i + \Sigma \beta_{ij}.\ln(p_j) + \Sigma \beta_{ik}.\ln(X_k). \qquad (7)$$

The assumption that firms are price takers can then be tested by the sign and significance of parameter estimates for input and output prices. Nonsignificant estimates would indicate that banks are not price takers in that particular market. Nonsignificant coefficients may also result, however, from inadequate proxies for the price variables and when the firm is not a profit maximizer. This was a possibility with the development banks in Honduras. The extent of competition may vary across products and across financial institutions, if differences in relative price efficiency across product lines are observed.

Elasticity estimates for outputs are expected to be positively signed, as an increase in the price for a particular output, ceteris paribus, should increase a bank's total profits. Negative signs are expected for inputs, since an increase in the cost of a particular input, ceteris paribus, should reduce profits.

The Data

The measurement of profits, variable-input and output prices and amounts, and fixed-input levels for Honduran banks was subject to major data and specification problems. The data on the bank's simplified income statement and balance sheet came from the records of the Central Bank of Honduras. Given the limited information disclosed, little disaggregation of the data was possible. Loans, for example, were aggregated into one single category. In addition, while the revenues and costs used to determine the proxies for prices were flow measures, the amounts of deposits and loans used for the same purpose were stocks. Moreover, the small number of institutions did not allow sufficient degrees of freedom to permit year-to-year estimations across the banks. Instead, a pooled time-series and cross-section estimation was necessary. Quarterly averages of monthly data were used.

Data problems reflected as well a larger role of implicit prices and greater incentives to manipulate accounting statements, both frequent responses to regulation. In general, the traditional indicators of performance of financial institutions reflected the limitations of the accounting data, more acute in developing than in developed economies (Camacho). Since the empirical specification of the profit function requires the use of economic rather than accounting financial data, the link between economic and financial variables was given by the user costs derived for all balance-sheet items by Hancock.

The assets considered in the economic balance sheet were: (a) cash (X1), which included reserves against demand and time deposits, and (b) loans and investments (X4), which were aggregated into one category. Financial assets were obtained as the sum of X1 and X4, less nondeposit and borrowed funds. Total assets were obtained as the sum of financial assets plus fixed assets. Financial liabilities were obtained as the sum of: (a) demand deposits (X2), (b) savings and time deposits (X3), and (c) fixed assets (Xk). Financial liabilities must equal financial assets. Total capital was obtained as financial capital (financial assets-X2-X3) plus physical capital and it represented the shareholders' equity. Off-balance-sheet sources of value should have been included, but information about their magnitude was not available.

Proxies

Inputs and outputs were measured in terms of a numeraire. Each Lempira disbursed as a loan or as an investment had a unit price. It was assumed that the bank had the right to claim the initial unit plus interest and services charges, such as fees and commissions, minus losses due to default and other premiums. User costs for outputs were defined as:

$$u_i = 1 - (1+r_i)/(1+R) \qquad (8)$$

where ri is the explicit interest rate charged, net of service charges and a provision for default losses, and R is the discount rate. Implicit interest should have been included in the computation of user costs, but information about its probable magnitude was not available. Similarly, for inputs and liabilities user costs were defined as:

$$u_i = -(1-K_i) + (1-K_i+r_i)/(1+R) \qquad (9)$$

where r_i is the explicit interest revenue, including service charges, Ki is the reserve requirement, and $(1-K_i)$ represents the fraction of liabilities that can be used as an input in the production of assets. Unit cost can be transformed into:

$$u_i = -1 + (1+r_i+b_i-s_i+R.K_i)/(1+R) \qquad (10)$$

where b_i is the bank's service charge and s_i is the bank's service cost. The role of regulation was explored through the evaluation of the impact of each instrument on bank profitability. Given the choice of user costs as the proxies for prices, the statutory level of each regulatory instrument was then used as a control variable, in order to assess its impact on price elasticities and on profitability.

Table 2 shows the choice of proxies for the inputs and outputs included in the profit function. This table also

indicates the impact of changes in the control variable on each proxy. The rate of inflation, used here as the discount rate is represented by p; R_i the statutory level of reserve requirements; d is the explicit interest rate paid on savings and time deposits; r_i is the explicit interest rate charged on loans; and w represents the level of bank wages. The sign of the impact of an increase in the level of the control variable on the price is also reported in Table 2.

Scale was measured as a combination of the volume of services provided and the amount of fixed inputs used, following the suggestion of recent studies of economies of scale in banking (Benston, Hanweck, and Humphrey). The available data included the volume of loans and deposits, but not the number and size distribution of the accounts. This restriction made it impossible to explore proxy sensitivity with respect to alternative measures of output. Information on the number and size of branches allowed, on the other hand, an exploration of the impact of network expansion on scale economies. Branch expansion may be considered also as a proxy for implicit-price competition, which seems to have been important in Honduras.

Test Methodology

The conclusions of recent research on test methodology were used to determine the order of the misspecification tests to be conducted (Phillips and McCabe, 1983, 1984). First, it has been found that the adoption of a more general model makes it possible to identify the correct model specification through the imposition and test of restrictions. Second, tests of structural change should be conducted prior to serial correlation and heteroskedasticity being tested and corrected if necessary. This procedure avoids conclusions about serial correlation or heteroskedasticity, which may not be present but that are reflected by the tests because of the failure to consider structural change. Third, a test of serial correlation should be conducted prior to a test of heteroskedasticity. Then, if serial correlation is present, either a Goldfeld-Quandt test or a Glejser test for heteroskedasticity may be more robust if applied to a Chrocane-Orcutt transformed model.

Estimation of the Profit Function

A three-stage least-squares estimation was undertaken in order to increase the efficiency of the estimator. This procedure makes a clear interpretation of each parameter estimate still possible. The intermediate two-stage estimates increase efficiency by eliminating the correlation between the exogenous variables and the disturbance term. The third-stage estimation further increases the efficiency of the estimator by correcting for covariance and correlation of endogenous variables across the system of equations.

Since the data set consisted of pooled time-series and cross-section data, the ordering of the observations affected the tests for serial correlation. For this test, the variables were sorted by bank first and then by year. On the other hand, to test for structural change and for heteroskedasticity the variables were sorted chronologically and by bank size, respectively. Thus, the system of equations was tested for structural change first and the observations were separated into two periods. The Durbin-Watson statistic indicated the presence of positive serial correlation for both periods. After the correction for serial correlation was made, the Park-Glejser test made the rejection of the hypothesis of heterosckedastic disturbances possible.

Finally, tests were conducted for the homogeneity conditions of the profit function and for the restrictions to simultaneous-equation estimation that derive from Hotteling's lemma. The system of the profit equation and the five input and output equations was estimated both imposing restrictions across equations and within the profit equation and as a seemingly unrelated system of equations without restrictions. The restrictions imposed by Hotellings' lemma could not be rejected, while the conditions for homogeneity could be maintained for prices and for all interaction coefficients, except for those of the fixed-input variables. The number of statistically significant coefficients increased while their values changed considerably when these restrictions were imposed.

Overview

The coefficients estimated for the final model were used to evaluate price elasticities at the geometric means of the variables and to explore the impact of regulation and the existence of economies of scale in banking. These elasticities are presented in Tables 3 and 4. These results suggest: (1) that there may be significant differences in the degree of technical efficiency of different types of intermediary, as a consequence of the scope of their activity and the extent of their specialization; (2) that there may also be differences in the price efficiency of development banks, due to their more limited emphasis on profit maximization; (3) that although there had been a considerable reduction in market concentration and although fairly uniform interest rates were observed, this might have reflected the enforcement of explicit-price regulations rather than competition; (4) that substantial and dispersed implicit interest charges may suggest that these banks are not price takers in the market for loans, while substantial explicit and implicit price competition seems to have characterized the market for deposits; and (5) that overall economies of scale seem to characterize the technology of Honduran financial intermediaries. These and other results are discussed below.

Technical Efficiency

Differences in the value of the intercept parameters of the profit function were investigated for the three different kinds of financial institution that operate in Honduras: commercial banks, savings and loan associations, and development banks. A consistently higher level of profits for a particular institutional type should result in a statistically significant non-zero difference in the value of the intercept parameter. The coefficients for the intercept dummy variable were significant at the 5 percent level for both savings and loan institutions and development banks. This finding of superior technical efficiency for the commercial banks may be explained by the adoption of superior technologies or by the existence of diversification economies that allow them to reduce their overall risk. While the technology of commercial banks allows them to operate with a wide range of deposits and loans, the savings and loan institutions specialize in mortgage financing only. The development banks also lend for restricted purposes only and do not actively mobilize deposits from the public as a source of funds. That commercial banks are more complete and diversified intermediaries allows them to produce a larger output from a given set of inputs, compared to the other types of intermediary.

Price Efficiency in Input and Output Markets

Dummy variables for the slope coefficients (price variables) were included in order to account for differences in price efficiency among institutional types. Statistically significant differences for the price coefficients were found only for the development banks, with respect to demand and savings deposits, as well as for loans. This suggests that these institutions were less price-efficient than other intermediaries. An explanation of this result might be that these public banks are not profit maximizers or cost minimizers. Rather, their objective function may depend on the volume of credit granted to a particular group or for a particular activity. Statistically significant differences in these coefficients were not found across the privately-owned institutions. There is, however, a possibility that this finding does not necessarily indicate equal price efficiency. This may be the case because the proxies for prices captured only explicit-price components, which were fairly uniform across institutions due to regulation. Effective prices inclusive of implicit components may vary substantially, on the other hand, if the degrees of price efficiency are different or if there is limited competition or market fragmentation. Unfortunately, implicit prices were not available.

Competition in Credit Markets

Uniform explicit loan yields prevailed in the Honduran financial market during the 1975-83 period. Since the proxy for loan user costs only captured the explicit components of this price, nonsignificant or incorrectly-signed coefficients for output prices may indicate that firms do engage in differential implicit pricing. The failure of explicit loan user costs to explain profits may thus reflect a high dispersion of the corresponding effective prices in the market. As shown by Lau (1972), this would indicate that firms do not behave as price takers in these markets.

The elasticity of profits with respect to the user costs of loans was:

$$d\ln\pi/d\ln p_4 = 0.15*\ln p_4 - 0.15*\ln p_2 - 1.33*\ln L + 1.39*\ln D \quad (11)$$

This elasticity is directly proportional to the explicit price of loans (p_4) and to the volume of deposits (D), and inversely proportional to the volume of loans granted (L) and to the explicit price of demand deposits (p_2) . This seems to confirm the hypotheses: (1) that the level of interest-rate ceilings has been below market-clearing levels and has reduced bank profitability, and (2) that deposit mobilization is a profitable activity for the intermediaries.

Impact of Reserve Requirements

During the period under analysis, demand deposits did not pay explicit interest and did not carry service charges, but still generated revenues for the financial institutions. The user cost for this variable captures the changes in reserve requirements imposed by the Central Bank. An increase in the level of reserve requirements, ceteris paribus, increases the cost of demand deposits and reduces bank profits. A statistically significant and negatively-signed coefficient should be observed for this variable. Insignificance or an incorrect sign may indicate that the institutions' desired reserves were higher than the regulatory requirements.

The elasticity of profits with respect to the user cost of demand deposits was:

$$d\ln\pi/d\ln p_2 = -1.31+0.14*\ln p_2-0.15*\ln p_4-0.76*\ln L+1.09*\ln D \quad (12)$$

This elasticity is directly proportional to the price of demand deposits (p_2) and to the total volume of deposits (D), and inversely proportional to the explicit price and to the volume of loans (p_4 and L) of a particular institution. This seems to confirm the hypotheses: (1) that an increase in reserve

requirements makes this activity less attractive for intermediaries, and (2) that an increase in the explicit price of loans, ceteris paribus, would make deposit mobilization more attractive to intermediaries.

Competition in Deposit Markets

Interest payments on savings and time deposits varied across financial firms for 1975-83. The significance of the coefficient for this price may indicate the bank's willingness to use this as a source of loanable funds and the existence of open possibilities for expansion and entry into the formal market for savings and time deposits. Restrictions on the interest rates paid on deposits can represent a barrier to entry if they reduce the opportunities for explicit price competition, while allowing for prestige and location to play too significant a role in consumer' choices.

The elasticity of profits with respect to the price of savings and time deposits was:

$$d\ln\pi/d\ln p_3 = 0.37*S_3 \qquad (13)$$

This result suggests that the explicit price paid on savings and time deposits was relevant only for the development banks during the second subperiod (S_3). This may indicate: (1) that explicit prices did not reflect the level of the effective rewards offered in the market for savings, and (2) that savings deposits were not an attractive alternative source of funds for the banks, perhaps because of the low rediscount rates from the Central Bank that prevailed during most of the period.

The Impact of Inflation

The impact of the inflation tax was explored by incorporating the annual rate of inflation in the price of cash. An increase in the rate of inflation increases the price of cash and therefore the cost of cash holdings and reserves for the intermediaries.

The elasticity of profits with respect to the cost of holding cash was:

$$d\ln\pi/d\ln p_1 = -0.12*\ln p_1 - 1.29*\ln p_5 \qquad (14)$$

This result indicates that an increase in the price of cash (p_1) resulting from a higher rate of inflation reduces profits through a higher opportunity cost of reserves and higher wages (p_5).

Economies of Scale

With a translogarithmic profit function overall economies of scale are given by:

$$d\ln\pi(x,\gamma^{*}X_k)/dX_k = \sum d\ln(\pi)/dX_k + \sum d2\ln(\pi)/d\ln(X_k)d\ln(Xj) \quad (15)$$

where γ is the economies of scale parameter, π is the level of profits, X_j is the level of variable inputs, and X_k is the level of fixed inputs. In terms of elasticities, a more-than-proportional increase in profits for a given increase in the amounts of the scale variables reflects the existence of economies of scale. If the sum of the elasticities equals one, the underlying banking technology exhibits constant returns to scale, and if this sum is less than one, the production function is said to be characterized by diseconomies of scale.

For Honduras, overall economies of scale seem to characterize the production function of banking firms, as the computed elasticity for the average size of firm is greater than one. However, given differences in the input and product mix of these multi-input, multi-output firms, the extent of such economies varies across institutional types. It was not possible, unfortunately, to differentiate by type of institution or by period in this connection, because the rank conditions could not be met for the available data set. Nevertheless, it was possible to consider both the amounts of services provided as well as the amounts of fixed inputs, by measuring them in terms of the number of branches and of their size. Interaction coefficients among these variables were included in the estimation, but statistically significant coefficients were not obtained with the model as specified.

The parameter for economies of scale was separated into three components, as follows:

$$d\ln\pi/d\ln Xk = -1.04*\ln L + 0.29*\ln D + 0.43*FA - 0.05*BR. \quad (16)$$

where L represents the volume of loans, D the total volume of deposits, FA the book value of fixed assets, and BR the number of branches. According to this result, overall economies of scale seem to result from the expansion of deposit mobilization. This suggests that a more active mobilization would be profitable. In Honduras, this took place mainly in the form of an expansion of limited-service branches in the urban areas. A larger number of branches, on the other hand, seems to reduce economies of scale, possibly as coordination becomes less effective and as some branches operate with unused installed capacity. This suggests that network expansion is in general costly for the intermediaries, but may be induced by interest-rate restrictions. Chavez-Presa obtained a similar result for Mexico. The expansion

of credit portfolios, on the other hand, seems to reduce the magnitude of the economies of scale. These results may explain why in recent years the Honduran financial institutions have not expanded their credit portfolios although the volume of deposits mobilized increased. Deposit mobilization was still profitable, but other investments (inflation hedges, government bonds) were more attractive. These results may also indicate that the effective yields on loans for the banks are substantially higher than the interest rate ceilings. When sizeable transaction costs for the borrowers are added, the total cost of funds for bank clients differs substantially from the levels proposed by the regulators (Cuevas).

Conclusions

The role and optimum configuration of financial regulation in developing countries is a complex and still unresolved issue (McKinnon, 1988; Dooley and Mathieson; Connoly and Gonzalez-Vega). It involves considerations of market failure, political economy, and the nature of financial technologies, many of which are beyond the scope of this paper. For over three decades, the Central Bank of Honduras has intervened in this country's financial markets. These interventions have seldom reflected the technical questions debated in this literature. Rather, they have been political responses to claims from interest groups to the effect that free financial markets do not promote social priorities in resource allocation and do not serve distributional goals. Despite these interventions, however, substantial segments of the population, particularly in the rural areas, still do not have access to financial services, and most market participants incur in very high transaction costs. In turn, the public financial institutions created to solve these problems have not been viable, given the high proportions of delinquency in their portfolios and operating losses that continuously decapitalize them.

This paper has presented further evidence about the negative consequences of regulation when it results in market fragmentation. The set of institutions observed, in terms of their size distribution and range of services supplied, seems to have responded more to the requirements of regulation than to the characteristics of banking technologies in a poor, developing economy. Interest-rate ceilings and reserve requirements, in particular, have introduced incentives for the operation of specialized intermediaries, which have been characterized by less technical efficiency than the commercial banks. These banks which, in turn, have been discouraged by the regulations from participation in the target market segments. Given the size of the market, however, less specialized intermediaries, with greater opportunities for portfolio diversification, seem to be more efficient from a technical point of view. Public development banks, on the other hand, have lacked price

efficiency, due to the nature of their objective functions, which have reflected more particular political objectives than the desire for financial viability and profit maximization.

Regulation promoted by the financial intermediaries through their influence on the Monetary Board seems to have restricted competition. The results suggest that an optimal market configuration would be characterized by a larger number of participating firms of a smaller size than the largest banks that operate at present (Camacho). The observed configuration has been sustained therefore, only because of the market segmentation introduced through regulation. During the period, the largest banks faced considerable rivalry from smaller intermediaries and showed less flexibility to adjust to the crisis than their smaller counterparts, but resorted to higher leverage in an attempt to retain their market shares. In summary, the reduction of concentration ratios and the entry of new firms suggests that competition has been increasing. However, regulation and greater restrictions to entry after the failure and bailing out by the Central Bank of a major institution, still stand on the way of a perfectly contestable market.

Table 1
HONDURAS: Basic Indicators, 1974-1983.

Year	Annual Rates of Growth				
	GDP	Prices a/	Total Liquidity	Domestic Credit	Public-Sector Share of Domestic Credit
1975	-2.0	8.0	.	.	10.2
1976	18.5	4.9	39.8	26.4	8.7
1977	16.6	8.4	18.8	22.4	9.6
1978	8.7	5.7	11.1	9.0	11.3
1979	2.4	12.1	-8.1	-4.4	12.7
1980	-3.8	18.1	-2.9	2.9	17.3
1981	-3.3	9.3	-0.3	2.7	20.6
1982	-2.7	9.4	5.5	2.1	20.7
1983	-2.7	8.9	9.7	-1.7	25.3

Source: Banco Central de Honduras, Boletin Estadistico, several years.
a/ Computed a the percentage change of the average Consumer Price Index

Table 2

Proxies for Prices and Control Variables.

Price For	Proxy	Control variable c	Impact of c d2 π/ dp.dc
Cash	1-(1/(1+p))	p	-
Demand Deposits	1-((1+R.p)/(1+p))	R	-
Savings Time	1-((1+d+R.p)/(1+p))	d	-
Loans	1-((1+r)/(1+p))	r	+
Labor	w	w	-

Table 3
HONDURAS: Bank-Profit Function Estimates using Three-stage Least-squares with Restrictions across Equations.

Var	Parameter Estimate	Standard Error	t-Ratio	Approx Prob>|t|
α0	-6.192702	3.391420	-1.8260	0.0722
S2	-8.017028	2.924402	-2.7414	0.0078
S3	-7.311125	2.706407	-2.7014	0.0087
T1	-0.084062	3.033912	-0.0277	0.9780
T2	-1.798509	4.918186	-0.3657	0.7157
T3	4.925563	3.127892	1.5747	0.1199
α1	-1.817239	1.333831	-1.3624	0.1775
α1T1	-0.351779	0.620303	-0.5671	0.5725
α1S2	0.903399	1.159412	0.7792	0.4385
α1T2	-2.000773	1.361034	-1.4700	0.1461
α1S3	0.500358	1.038966	0.4816	0.6316
α2	-1.312488	0.769408	-1.7058	0.0925
α2T1	0.264541	0.433966	0.6096	0.5441
α2S2	0.151870	0.709727	0.2140	0.8312
α2T2	-2.107972	0.820813	-2.5681	0.0124
α2S3	-0.670749	0.914771	-0.7332	0.4659
α2T3	-0.670749	0.914771	-0.7332	0.4659
α3	0.014476	0.351742	0.0412	0.9673
α3T1	0.047198	0.145840	0.3236	0.7472
α3S2	-1.025695	0.717093	-1.4304	0.1571
α3T2	0.211185	0.771580	0.2737	0.7851
α3S3	0.371504	0.222550	1.6693	0.0996
α3T3	0.371504	0.222550	1.6693	0.0996
α4	0.286992	0.852831	0.3365	0.7375
α4T1	-0.368211	0.360020	-1.0228	0.3100
α4S2	0.816577	0.614522	1.3288	0.1883
α4T2	-1.236434	0.651786	-1.8970	0.0620
α4S3	-0.100557	0.204440	-0.4919	0.6244
α4T3	-0.100557	0.204440	-0.4919	0.6244
α5	3.828258	1.544722	2.4783	0.0157
α5T1	0.408252	0.779347	0.5238	0.6021
α5S2	-0.846150	0.885435	-0.9556	0.3426
α5T2	5.133993	1.486144	3.4546	0.0009
α5S3	-0.100557	0.204440	-0.4919	0.6244
α5T3	-0.100557	0.204440	-0.4919	0.6244

Table 3 **(continued)**

Var	Parameter Estimate	Standard Error	t-Ratio	Prob>|t|
αL	2.684999	1.901886	1.4118	0.1625
αLT1	-1.476050	1.302154	-1.1335	0.2609
αLS2	-4.649265	2.717097	-1.7111	0.0916
αLT2	6.036725	2.688973	2.2450	0.0280
αLS3	-0.754604	1.431212	-0.5272	0.5997
αLT3	-2.122478	1.745120	-1.2162	0.2280
αD	-0.605088	1.937772	-0.3123	0.7558
αDT1	1.224500	1.124058	1.0894	0.2798
αDS2	6.758231	3.290712	2.0537	0.0438
αDT2	-8.290510	3.285055	-2.5237	0.0139
αDS3	2.578950	1.484321	1.7375	0.0868
αDT3	1.277784	1.691727	0.7553	0.4526
β11	-1.119666	0.460535	-2.4312	0.0176
β13	-0.165199	0.172015	-0.9604	0.3402
β15	1.284865	0.383485	3.3505	0.0013
β1L	-0.178064	0.265685	-0.6702	0.5050
β1D	-0.008626	0.080935	-0.1066	0.9154
β22	0.147378	0.052060	2.8309	0.0061
β24	-0.147378	0.052060	-2.8309	0.0061
β2L	-0.765203	0.433686	-1.7644	0.0821
β2D	1.088517	0.446142	2.4398	0.0173
β33	-0.015219	0.021546	-0.7063	0.4824
β35	0.180417	0.183193	0.9848	0.3281
β3L	-0.047462	0.310630	-0.1528	0.8790
β3D	-0.036003	0.284145	-0.1267	0.8995
β44	0.147378	0.052060	2.8309	0.0061
β4L	-1.329748	0.526448	-2.5259	0.0138
β4D	1.390491	0.485963	2.8613	0.0056
β55	-1.465283	0.374636	-3.9112	0.0002
β5L	2.320478	0.747094	3.1060	0.0028
β5D	-2.434378	0.694036	-3.5076	0.0008
βLL	-1.037300	0.314972	-3.2933	0.0016
βDD	0.285956	0.451499	0.6333	0.5286
βDB	0.380326	0.701223	0.5424	0.5893
βDL	0.693148	0.630198	1.0999	0.2752
μ	-2.006708	0.844410	-2.3765	0.0203
BR	-0.156320	0.562140	-0.2781	0.7818
FA	0.431682	0.168891	2.5560	0.0128
FB	-0.047927	0.022299	-2.1494	0.0351

Table 4
Price elasticities of the Profit Function.

Coefficient	Value	Expected Sign
Technical Efficiency		
Commercial Banks	-6.1	
S&Ls	-8.0	
DBs	-7.3	
Price Elasticities		
$d\ln\pi/d\ln p1$	5.8	Incorrect
$d\ln\pi/d\ln p2$	1.5	Correct
$d\ln\pi/d\ln p3$	-4.1	Correct
$d\ln\pi/d\ln p4$	0.4	Correct
$d\ln\pi/d\ln p5$	-3.6	Correct
Scale Economies		
$d\ln\pi/d\ln L$	-0.7	
$d\ln\pi/d\ln D$	2.9	
$d\ln\pi/d\ln FI$	0.4	
Total	2.5	

APPENDIX
DEFINITION OF ECONOMETRIC PARAMETERS.

Coefficient and Variable Definition.

π	: profits
$\alpha 0$	: intercept coefficient
S2	: intercept dummy variable for S&Ls
S3	: intercept dummy variable for DBs
T1	: intercept dummy variable for CBs for second period
T2	: intercept dummy variable for S&Ls for second period
T3	: intercept dummy variable for DBs for second period
αi	: coefficient for the price of input/output i
αL	: volume of loans
αD	: volume of deposits
βii	: quadratic term for input/output i
βik	: interaction term for input/output i and input/output k
βiL	: interaction term for input/output i with loans
βiD	: interaction term for input/output i with deposits
βLL	: quadratic term for loans
βLB	: interaction term between loans and number of branches
βDD	: quadratic term for deposits
βDB	: interaction term between deposits and branches
βDL	: interaction term between loans and deposits
βiSj	: slope dummy coefficient for input/output i and institution type j, first period
βiTj	: slope dummy coefficient for input/output i and institution type j, second period
βLTj	: dummy variable for loans for institution type j, first period
βLSj	: dummy variable for loans for institution type j, second period
βDTj	: dummy variable for deposits for institution type j, first period
βDSj	: dummy variable for deposits for institution type j, second period
μ	: relative number of equivalents firms.
BR	: number of branches
FA	: value of fixed inputs
FB	: interaction coefficient between BR and FA

End Notes

Dr. Camacho is a recent graduate from The Ohio State University and Prof. Gonzalez-Vega teaches agricultural economics and economics at the same university. This research was funded in part by the agricultural credit project in Honduras, sponsored by the U.S.A.I.D. Mission in Tegucigalpa. The authors want to thank the staff of the Central Bank of Honduras and of the U.S.A.I.D. Mission for their support.

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